

REMARKS

Amendments

In the claims, claim 1 has been amended and now recites that the adhesive bonding the conductive member and at least one of the two electrodes comprises a synthetic resin. Basis for this is found on page 7, lines 7-15 of the specification. Claims 8 and 10 have been amended in view of the amendment to claim 1. Claims 4 and 5 have been amended to recite that it is the second electrode that is bonded to the conductive member via a weld (claim 4) or solder (claim 5). Basis for this is found on page 9, lines 3-7. These amendments have been made in the interest of rapid prosecution and without prejudice to Applicant's right to prosecute claims similar or different to the unamended claims in one or more continuation or divisional applications.

The Rejection Under 35 USC § 103(a)

Applicant respectfully traverses the rejection of claims 1 and 4-5 under 35 USC § 103(a) as unpatentable over Inoue (Japanese 8-250304) in view of Hasunuma et al. (U.S. Publication No. 2002/0181182), insofar as the rejection is applicable to the amended claims. [The Inoue reference is referred to in the Office Action as "EPO-08250304", as an abstract from the European Patent Office was sent for this document.]

The present claims are directed to a PTC thermistor in which at least one electrode is attached to a PTC element (member) comprising a conductive polymer by means of a conductive adhesive containing a synthetic resin. The adhesive is designed so that when it is exposed to a high temperature for an extended period, i.e. in a temperature range in which the conductive polymer thermally expands, it will deteriorate, causing the resistance of the adhesive to increase. As a result, the current flowing through the PTC element decreases and the voltage that was borne primarily by the PTC element in the beginning is also borne by the adhesive. Eventually, when the electrical resistance of the adhesive becomes greater than the electrical resistance of the PTC element, the adhesive primarily bears the voltage. The thermal energy consumed by the PTC element is reduced, the PTC device returns to a low resistance state from a high resistance ("tripped") state, and self-generation of heat stops. Thus, a state where the PTC element fails is not reached and the safety of the circuit in which the PTC device is installed is maintained.

Inoue discloses a PTC thermistor in which a lead wire having a spring property is soldered to a nickel/tin electrode on the surface of the PTC thermistor. The other end of the wire is soldered to a substrate so that a force is provided. When an overcurrent or overvoltage is applied, the solder melts, releasing the lead wire from the PTC thermistor via the spring. In contrast to the present claims, Inoue does not teach the use of a resin-containing adhesive that deteriorates for attaching an electrode to a polymeric PTC element. Rather, Inoue teaches that a solder based on a tin-lead eutectic (with no synthetic resin), melts (not deteriorates) under overcurrent conditions. When a solder melts, its resistance may increase, but such an increase is not “irreversible” as is recited in the present claims, for when the solder cools, its resistance decreases. Furthermore, while present claim 5 does recite that an electrode is attached by solder, it the second electrode, and at least one electrode is still attached via a resin-containing adhesive.

The deficiencies of Inoue are not resolved by the addition of Hasunuma et al. Hasunuma discloses circuit protection arrangement particularly useful in protecting battery assemblies. The arrangement contains a first PTC device which has a first switching temperature, has a hold current at a first specified temperature and is made from a first PTC resistive element composed of a first conductive polymer composition attached to first and second electrodes. A second PTC device is electrically connected in series with the first PTC device, has a second switching temperature which is less than the first switching temperature, has a resistance less than that of the first PTC device, has a hold current which is greater than the first device, and is made from a second PTC resistive element composed of a second conductive polymer composition attached to third and fourth electrodes. The hold currents are such that at a temperature below a critical temperature, the first PTC device switches into a high resistance state and the circuit protection arrangement is resettable, and at temperatures greater than the critical temperature, the second PTC device switches into a high resistance state and initiates an action causing the circuit protection arrangement to permanently open. In paragraph [0035], Hasunuma teaches that a thermal fusing element, which may be solder or a conductive adhesive, may be used to open the circuit. There is no teaching, however, of the use of a resin-containing adhesive that deteriorates for attaching an electrode to a polymeric PTC element. In fact, one who would combine Inoue with Hasunuma would be taught the use of an adhesive for attaching a device having a spring wire onto a substrate.

Applicant respectfully traverses the rejection of claims 3 and 8-13 under 35 USC § 103(a) as unpatentable over Inoue (Japanese 8-250304) in view of Hasunuma et al. (U.S. Publication No. 2002/0181182), insofar as the rejection is applicable to the amended claims.

As discussed above, the combination of Inoue and Hasunuma does not teach presently recited claims 1 and 4-5, still less claims 3 and 8-13. There is no teaching of the use of a resin-containing adhesive that deteriorates in resistance irreversibly for attachment to the conductive member. Thus this rejection is unfounded.

Disclosure Under 37 CFR § 1.56

In fulfilling the duty of candor and good faith, the following document is hereby disclosed to the Patent Office in accordance with 37 CFR § 1.56. It is not admitted that the information in the listed document is material to patentability as defined in 37 CFR § 1.56(b). The Examiner is requested to consider the document in the examination of this application.

Accompanying this paper is a form listing the document. The Examiner is requested to return an initialed and signed copy of the form once the document has been considered.

As indicated in the section titled "The Rejection Under 35 USC § 103(a)", one of the documents on which a rejection is made is Japanese Publication No. 8-250304, which was indicated as being a European document. For clarity, the Japanese document is being submitted. A copy of this document is attached.

FOREIGN PATENT DOCUMENTS

Document Number	Publication Date	Name of Patentee or Applicant	Translation
JP-8-250304-A	09-27-1996	Nichicon Corporation (Inoue)	Abstract

Fee

Applicant believes that because this Disclosure Statement is being submitted with an RCE, no fee is due. If this is incorrect, please charge any necessary fee to Deposit Account No. 18-0560.

Conclusion

It is believed that this application is now in condition for allowance and such action at an early date is earnestly requested. If, however, there are any outstanding issues which can be usefully discussed by telephone, the Examiner is asked to call the undersigned.

Respectfully submitted,

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